Improving concentration and perseverance with the Digital Fabrication.

Roussel Vivien
Compagnons du Dev/ Ax4Lab
23 rue Navoiseau, 93100 Montreuil, Seine-St-Denis, France.
vivien@co-dev.org

ABSTRACT
The Digital Fabrication creates new educational possibilities.
The recent research show how it can help support other ways of learning, mainly through both skills development with technology and collaboration among students. We think that we can use this method of learning for a public popular, victim to the social divide. We use digital fabrication like a positive system for motivating the young school dropout. We have deployed a social fablab, between a training center and a fablab, in a popular area. The issue is to give a second chance at to the young people . For this, we focus on the construction of attention and the concentration. The project is to show young people motivation and to ensure that they feel concerned . they are investing them in a task and, thus learn perseverance. We try to working on a part of cognition for help them to understand and discriminate informations. The digital fabrication can help to focus on the attention and develop perseverance, therefore it can be used as a great lever to reintegrated professionally young people. Here we trying to demonstrated the efficiency of this method, the possibility to ameliorate improve this and the limits of datas withdrawn of the first promotion.

Author Keywords
Perseverance- concentration- attention- empowerment – Digital Fabrication

INTRODUCTION

Since 10 years, the mix between education and technologies is living a revival in society. The young generation is very excited by the use of technologies, but they are more consumer than producer. If we want that they be concerned by the future we need to form them to technologies proper use. DF create new educational possibilities, and recent research show how a new way to learn is helping young people mainly through both skills development with technology and collaboration among students. We think that we can use this new way to learning for a public popular, victim to discriminate social and sometime who stopped going to school . We use digital fabrication like a positive system for motivating young people to work with us. We believe that digital fabrication can also help to get the attention and perseverance, and therefore can be used as a great lever reintegrated professionally and socially young people. In this paper, we present a case study of a pedagogical experiment on this public and with special context area.

Social context

La Fabrique Numerique de Gonesse is a social Fablab designed for this specific public. This motivation borned after have co-founding two fablabs and the meeting with the Co-dev Association, with the observation of lack of social' s diversity in the French fablabs in general. The typical public is : people degree, white people , the thirty-year-old and which comes from the middle-class. The second observation is our experiences in many workshops done with adult, children, and more : we know that DIY and DF are positive for them. Many of papers on education speak about the improvement of "Gestalt" and "self-esteem", for example the Reflective Design-Based Learning (RDBL Bekker et al., 2015), just we don't want only focus on design but more on cognitive capacity of our special public. Moreover, we can thinking about the possibility to use fablab space like socialised space for training underprivileged people to learning social code and to be access to informations. Numbers of social studies prove that there are a correlation with the second circle of socialisation and social success (J. Piaget - J. Lautrey, 1984). Fablabs are a chance for popular publics to access at the social-middle class code and may be more; exposing them to changes technological, and thus narrow the social divide and numerical.

There are any factors for explain the problems of drop-out school, and we can organised like this (non exhaustive and no order) :

- the personal factors : self-control, social skill, peers to peers, "habitus" (Bourdieu), conciliation studies-working.
- the health and the well-being : self-esteem, the depreciate feeling, drugs, wellness, aspirations.
- the cognition : literacy, numeracy, motivation, comprehension.
- the school : relation at school, identity to school, learning practices, the framework.
- the social : community, socio-cultural and economic context, the area, resources.
- We treat most of this factors with the city's institutions, like Local Mission (an organism devote to help people on his territory), the school of second chance, etcetera.

A territorial social Fablab

The training center "La fabrique Numerique de Gonesse" is a social fablab, open in the "la Fauconniere" area at Gonesse, a popular district at less 30 km of Paris to North Est. Here, the social context is difficult, the unemployment rate is high (nineteen point two pourcent on Val d'Oise territory), so lot of young people have nothing to do, risking to fall in delinquency. There are social criterias for the selection of profiles that we discuss with the city administration. The curriculum of La Fab Num is free and open at twelve to fifteen students, aged between sixteen - twenty five years old, and who have dropped out to school and/or non-degree . During five half month, they follow a training on digital fabrication for learn skills and individual's self-identification in social group. The time of training is of four hundred thirty hours, this is divided in twenty hours by week - four days, to reason of five hours by day. We start at nine past half am until twelve past half pm, with one break between. And the afternoon is as follow : one past half pm at four past half pm with one pause. We have doing the choice of leave free two days (friday and saturday) for those that want to find a mini job or to approach potential employers. This structure can't delivering any diplomas, but it's a device for re-engagement and a work on identity code. We have received the french label "Grande Ecole du Numérique" (Great Digital School) who certify the training device by the Ministry of National Education, and in addition to grants granted on social grounds. We are five supervising staff : one for global partnership, one expert in training framework, two for media education, one for fablab education. Sometimes, others experts intervene for special pattern- work.

HYPOTHESIS

The process work is special, we work on demand for the city and the territory on a request (for an association, an enterprise, an institution, etcetera). The young people are the start point of specifics and originals solutions. We use different pedagogical methodologies, and especially we adapt us to the public. Because, the DF have needed to be adapted for to be accessible for person who haven't skills. We think there are a cognitive gap to filling for this public, not just how-to, but built a new capacity to concentrate oneself and persevere on a task. Our aim is to understand how can digital technology help support drop-outs. We work in this direction and we think that when the young people progress in DF, their cognitive capacity are improved. Their self-esteem is better and their motivations strengthened. We defend the position that DF can help trigger attention and perseverance, especially reintegrated marginalized young adults who dropped-out from the education system. DF is particularly adapt, cause are tangible and demand to concentrate oneself on lot of micro-task, so this belonging as a whole (gestaltist theories). For construct an "empowerment", we have need to create a protocol. First, the concentration of a complex task impose to keep the attention for resolve a problem, and this public is difficult to mobilizing.

We have elaborated a flexible protocol for organised and process the projects - in the same style of RDBL (Reflective

Design-Based Learning) - inspired by some agile management and the cybernetics work of Louis Couffignal (La cybernetique, 1963) :

1. Understand the order.
2. Action : imagine actions and get ready the task.
3. Knowledge : taking decisions and execution.
4. Change : liability – deterministic, random / iteration and retroactive.
5. Improvement.

1. We built with them the responses for the command in sequences in order to procedure : what we have to do? what we don't know? Where we can find the answer? How we can discriminate different solutions? How many time and how to determinate the steps for concretise the project ? What skills we need? We use the form a problem tree for helping to visualisation. The understanding need to be atomizing - reduce in lot of little particles of knowledge, to rank the tasks and informations for to be efficient. Each young takes decisions to improve pragmatism permitting to strengthen the acquisition of knowledge with establishing of criterias. In more each young people can participate and use his own intelligence (deductive, analytic, etcetera).

2. Action is the whole of the tasks who consist to prepare the upstream work. The capacity to imagine actions is based on a expertises, and the projection of a model. The model is source of discussion and we are there for to lead the better choices in correlation with materials, skills in presence... We divide this in "basic skills" useful for the realisation of the task. The staff is here for help and anticipated that the steps to done are accessible by the youths. We help youth to elaborate a proportional solution to works. They can use internet and all sources of knowledge together for find solutions. In the same time, he understand each parts and know that he learn some news method et technologies for fixed the project. We divide this in "basic skills" useful for the realisation of the task. We progressively learn to them all technics and technologies we have need in project : infographics, movies, video-game, web, programmation, robotic, electronic, 3D printer, laser-cutting machine, and more. The result of this basic workshops is to help them to understanding technological impact on their future – to have a growing awareness on reality.

3. The knowledge : taking decisions and execution characterize the idea that the project are a collective produce of knowledge. The investment of the young are proportional to his own concern, it's counterproductive to compel the student to working on a task he don't want. Sometimes, this opening allow to convince a person to rejoin the rest of the group. In additional, we produce registered documents on workshops. This a member (self-designated or not) explain actions, take pictures, complete collective e-porfolio. This sharing activities are occasion of improve, to awareness, for him and others. The history built a group.

4. During the work, we provide an overview on the advancement of project (in start session - morning and afternoon, and 15 last minutes before finish the day). At this moment we can search why something is wrong ? It's a test for the model previously thinking face to the reality. We observe and note the mismatch or not. There are 3 ways : liability, deterministic, random.

- Liability : it's all right, the protocol run.
- Deterministic : project isn't conform to previous decisions. The failures result to deterministic agents. We can resolve this by an iterative protocol who rectify the problems. Corrective for little modifications, retroactive for lot of fails.
- Random : we don't know why this not conform and we don't no the way for fix it.

The iteration is a recursive procedure, she help to unbuilt and resolve actively the project with deduce. Each young can participate and valorise himself or others.

5. The Improvement is a bonus. This protocol is used for deduce schemes and extract methods of right actions (but relativise the generalisation). It's optional, however important for the young appropriate the tools and skills. In this interstice born creativity.

In some way, we are like a little factory with agile management. And, as we lead a research-action study by conducting the curricula ourselves, we have iterating on our own design of short iteration cycles.

OUR RESULTS
We have create a questionnaire for notify how youngs define theirs capacity to persevere. It's a hard things to find how identify acts who describe that you research. Questions are relative to the capacity to understand the project, the interest of some project, the time pass on a task, motivation and the self-esteem. It would take too long to list all here... so I extract most interesting measures. In this promotion Alpha, we had thirteen youngs, one left the device after two months, and an other is treated in a psychiatric hospital. So, there are eleven young adult who have answer at the questionnaire.

Avez-vous eu l'impression d'avoir travaillé plus dur que d'habitude ?

	oui	7	63.6%
	non	4	36.4%

oui
non

Avez-vous l'impression de pouvoir vous concentrer plus longtemps maintenant par rapport à avant cette formation ?

	oui	10	90.9%
	non	2	18.2%

oui
non

Figure 1. Questionnaire : (- in yellow) Have you feeling that you can focus yourself now more longer than before training? (in green) Have you the impression you can focus more longer now after the training than before?

In figure 1, seven students answered yes, when we asked them if we worked hard. but ten students affirm they have the impression of being able to focus more now after the fablab training than before. We can see that there are twelve persons on the second question, some said yes and no , it shows they are undecided. When ask to precise why, we reap this answer (translating) :
- "i'm more motivated than before"
- "we are motivated and we respect ours choices"
- "because I was interested by nothing, now I make effort of work more easiest cause I had understanding that my successes (in fablab), will be useful in my life"
- "I occur to concentrate me in domains untils here unknown. But I admit that interest to be here for me."
- "Because i'm more motivated, I manage better my tasks and research solutions. I'm better organised."
- "I know that i can learn, thus I concentrate me more easiest."
- "I take again confidence in me."
- "I was interested by everything, so it motivate me".
- "It depend tasks, but now, I know stayed sitting for finish the job."

Overwall we have the impression that students have the feeling to be able to focus more than before. This is confirm by a another question, like in figure 2. Just one said no, and we can attributed this to his cognitive incapacity to make choices...

**Ces projets vous ont ils redonné confiance en vos capacités ?**

	oui	10	90.9%
	non	1	9.1%

oui
non

Figure 2. Questionnaire : These projects have they given back you confidence in your abilities?

Combien de temps pouviez vous vous concentrer d'affilé avant la formation ?
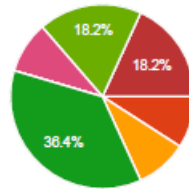
moins de 5 min	0	0%
10 min	1	9.1%
20 min	1	9.1%
30 min	4	36.4%
45 min	0	0%
1h	0	0%
1h30	1	9.1%
2h	2	18.2%
3h	2	18.2%
plus de 3h	0	0%

Combien de temps pouvez vous vous concentrer maintenant ?
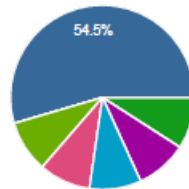
moins de 5 min	0	0%
10 min	0	0%
20 min	0	0%
30 min	1	9.1%
45 min	1	9.1%
1h	1	9.1%
1h30	1	9.1%
2h	1	9.1%
3h	0	0%
plus de 3h	6	54.5%

Figure 3. Questionnaire : How long could you capable to concentrated yourself before training ? How long can you now concentrate yourself ?

Here a comparison of the answer of figure 3. We can see that young define themselves with a better capacity.

time	-5min	10min	20min	30min	45min	1h	1h30	2h	3h	+3h
before	0	1	1	4	0	0	1	2	2	0
after	0	0	0	1	1	1	1	1	0	6
variance	0	-1	-1	-3	1	1	1	-1	-2	6

In the follow figure 3, we have asked to the young if they have the feeling to strive to do better. We can see that there are 13 answers, so 2 persons have to be uncertain.

Avez-vous eu le sentiment de vous dépasser ?

oui	8	72.7%
non	5	45.5%

Figure 4. Questionnaire : Have you the feeling to strive to do better?

OBSERVATION

We have too done some interviews for have others opinions and some observation on the global activities in the fablab.
Not exactly a classic interview but more an exam with outdoor personalities : one professional in 3D printer, a representant of city, and a member of the staff.

- They define themselves that they have augmented their capacity to concentrated. Salima said during the final exam that she has a better concentration, before it was difficult to concentrate herself twenty minutes... Today, she feel herself able to stay on her work for several hours. In addition, she said that she is appeased with school, thus she have a purpose when she wake up. And another way when we are out of hours of training, the students ask me if they can come , send me emails or sms. For example, Khalil now create a prototype for him about a DJ

mixer with arduino technologies or a music instrument with arduino and lasers. Or also as, Ismael came back after training to make again a notebook in wood (a friend of him broke it) he had already create it and he loved that.

- The young people were here all mornings (sometimes 15 minutes to late - but isn't frequent use) and they stayed in the fablab until 5 - 6 pm... whereas the curriculum was finished to 4:30 pm.
- Lots of youths want to continue to come in Training structure for learning more and use this space like a fab lab/ hackerspace. They work to form an association for continue to exploit theirs news skills and machines. We encouraged them to create a community of alumni for create the first core for the autonomous fablab.

DISCUSSION

We can speaking long time on the possibility to reap better data and informations on the efficiency of the pedagogical method. This first promotion was experimental. For the second promotion who is in half- parcours now, we think put in place these type of questionnaires and may be more, like movies-interviews. I think that for have a good idea of the protocol, we need to catch the essence of DF... But, how does/can/could digital fabrication support efficiently attention and perseverance and re-motivate the dropouts school's children - what are the factors behind ? These results are overall positive. They show a first successful experience. Otherwise, now it is necessary to make durable result and and improve the face of new situations. Even if the result is debatable, the young are very happy to have follow the training and a result on their motivation is really visible. Now, lot of them want to be entrepreneurs or back to school with the conviction that this experience made them strengthen. We need to thinking how some workshop done on personnal value and constistition of the team impact the result of DF. This paper is concentrate on improvement and perseverances but we working in parallele on identities with interviews and social follow. We working on intrinsic motivation and interest for professionnal and personnal investments. We do MTBI test also for help them to understand and thinking about herself it's a paralele work with DF.

References

P. Blikstein, (2014).
Reempowering powerful ideas,
Proc. of IDC.

S. Papert, NY, (1980).
Mindstorms: Children, Computers, and Powerful Ideas.
Basic Books, New York.

Ole Sejer Iversen, Rachel Charlotte Smith, Paulo Blikstein, Eva-Sophie Katterfeldt, Janet C, (2015).
Digital fabrication in education: Expanding the research towards design and reflective practices.
In International Journal of Child-Computer Interaction, Volume 5, September 2015, Pages 1–2, Digital Fabrication in Education.